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ABSTRACT

Forty-three elementary education majors in three classes took part in this study of the effectiveness of class voice instruction for elementary school children on vocal knowledge, attitudes, and vocal performance of the study participants. Two classes were assigned to one of the treatment conditions (vocal instruction with breath emphasis and vocal instruction without breath emphasis), and one class served as a control group. All groups met twice weekly over a 10-week period for the same instruction as prescribed by the course syllabus. However, both vocal instruction classes began with a 10-minute voice lesson. The major difference in the vocal instruction for these two groups was in the amount of emphasis given to proper breathing techniques. The results suggest that vocal instruction for elementary classroom teachers is beneficial for improving vocal knowledge and some elements of attitude and vocal performance. However, the effects of breath instruction on changes in breathing mode, while increasing depth of breathing, may take longer than anticipated in producing significant results, especially among untrained singers. The use of instrumentation for recording breathing patterns was found to be an objective and highly reliable procedure for the study of breathing and its effects on singing. Appendices provide tests of vocal knowledge and a measure for self-perception of singing abilities. (Author/JD)

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The Effects of Class Voice and Breath Management Instruction on Vocal Knowledge, Attitudes and Vocal Performance among Elementary Education Majors

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The Effects of Class Voice and Breath Management Instruction on Vocal Knowledge, Attitudes and Vocal Performance among Elementary Education Majors

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ABSTRACT

This study investigated the effectiveness of class voice instruction, with and without emphasis in breath management, on vocal knowledge, attitudes, and vocal performance of university elementary education majors. Two of three intact classes were assigned to one of the treatment conditions, and one class served as a control group. All groups met twice weekly over a ten week period for the same instruction as prescribed by the course syllabus. However, both vocal instruction classes began with a ten minute "voice lesson." The major difference in the vocal instruction for these two groups was in the amount of emphasis given to proper breathing techniques. Dependent variables included measures of vocal knowledge, attitude towards singing instruction, self-perception of singing abilities, and vocal performance (high and low pitch, range, vocal pitch accuracy, vocal quality, duration, and abdominal and thoracic breathing displacements).

Based on the results of a series of MANCOVA and ANCOVA analyses, vocal instruction for elementary classroom teachers improved vocal knowledge, and some elements of attitude and vocal performance. Emphasis on breath instruction improved vocal quality. However, the effects of breath instruction on changes in breathing mode, while increasing depth of breathing with greater abdominal-diaphragmatic displacement, may take longer than anticipated in producing significant results, especially among untrained singers. The use of instrumentation (Respitrace) for recording breathing patterns was found to be an objective and highly reliable procedure for the study of breathing and its effects on singing.

The Effects of Class Voice and Breath Management Instruction on Vocal Knowledge, Attitudes and Vocal Performance among Elementary Education Majors

Teaching children to sing in the elementary school has received renewed interest in recent years (Atterbury, 1984; Goetze, 1985; Phillips, 1983, 1985; Stafford, 1987). Stafford (1987), for example, reports that 79 percent of college methods instructors and 69 percent of elementary music teachers surveyed in the southern geographical region of the United States felt that elementary school children should receive specific instruction in singing. College methods instructors also listed "vocal development" higher than "music literacy" when asked to rank order the most important outcomes for elementary school singers. Today, the primary responsibility for developing a child singer falls to the elementary music specialist. However, with music teaching positions being eliminated or limited by many school districts, elementary classroom teachers must assume more responsibility in the teaching of music. Singing instruction may become more and more the total responsibility of the classroom teacher, or as Coffman (1981) suggests, a shared responsibility among classroom teachers and a smaller number of elementary music specialists.

But how prepared are elementary classroom teachers to assume these responsibilities? Elementary education majors are required by most colleges and universities to take some course work in music education. However, the amount of time given to classroom teacher training in music is quite small, one or two courses at most schools. This preservice education may not be enough to increase classroom teachers participation or interest in teaching music (Goodman, 1986; Picerno, 1970). Picerno (1970b) found that classroom teachers felt that many musical activities such as conducting groups or teaching music theory and history were beyond their competencies. However,

both Picerno (1970b) and Pendelton (1975) report that the activities judged by classroom teachers to be most within the range of their teaching abilities focus on singing.

This is not to say that classroom teachers feel completely comfortable teaching children to sing. Evans (1958) notes that singing problems are among the most common factors affecting the attitude of the elementary classroom teachers toward teaching music; singing along in front of the class, for example, is reported to create a strong feeling of insecurity among these teachers. Training and experience in singing, though, may play a key role in overcoming negative attitudes. Gelineau (1960) and Slagle (1967), for example, both found that increased exposure to and training in singing improved teachers attitudes toward music instruction in general.

Unfortunately, preservice classroom teachers training in singing is minimal. An examination of the content of methods, texts and basal series used for such instruction (Kavanaugh, 1982; Phillips, 1983), reveals little information about developing the psychomotor skills needed for singing, such as breath control, enunciation, posture and projection. Stafford (1987), in fact, reports that "Eighty-eight percent of the college methods instructors . . . expressed a lack of confidence in the adequacy of methods classes to develop the competencies necessary for guiding young singers" (p. 134).

The goal of the present study was to investigate the effects of vocal pedagogy instruction on elementary preservice teachers attitudes, vocal knowledge and vocal performance. The study closest to the present study was conducted by Barnes (1987). She investigated the effects of class voice instruction and differential song material on vocal performance, vocal knowledge, and attitude of 113 elementary education majors. One intact class served as a control group receiving no music instruction while subjects from two other classes were randomly assigned to three treatment groups, two of

which combined vocal pedagogy instruction with singing practice and the other which consisted of singing practice only. Subjects practiced singing traditional art songs in one pedagogy instruction group and children's songs in the other pedagogy instruction and in the singing practice only group. The investigator met each group for 40 minutes, twice a week for 5 weeks. Vocal pedagogy instruction included such techniques as posture, breathing, diction, intonation, vocal quality and projection. Subjects were pretested and posttested on their ability to sing the song "America" and posttested only using investigator-designed measures of vocal knowledge, attitude toward singing instruction, self-perception of singing ability and vocal performance.

On performance measures, Barnes results provide some support for vocal pedagogy instruction combined with singing practice. The group that received vocal pedagogy instruction plus practice singing children's songs showed significant gains in posture and vocal quality and significantly higher posttest ratings than the other groups on projection. On vocal knowledge measures, this group outperformed the control group. On the attitude measure, only the group whose vocal pedagogy instruction combined with practice in traditional art songs scored higher than the control group.

However, weaknesses in the Barnes study call the results into question. One weakness was the use of multiple t-tests to assess changes in vocal performance measures, thereby inflating the probability of Type I Error. Given that Barnes was able to randomly assign subjects to her treatment conditions, split-plot MANOVAS or ANOVAS (with treatment as a between-subjects factor and time--pretest and posttest administrations of the same measures as a within-subjects factor), or one-way MANOVAS or ANCOVAS (with pretests as covariates and the treatment as a between-subjects factor) would have been more appropriate ways to analyze the data.

A second weakness was the limited evidence about the reliabilities of measures. For example, no reliability estimates were given for vocal knowledge or attitudinal measures.

A third weakness was the use of subjective measures of breathing. Breathing was assessed by judge's ratings of videotapes of the subjects singing. Subjects breathing during singing can be measured more objectively and reliably by a Respitrace™ (see Phillips 1983, for example).

A fourth weakness was the use of the same song in pretest and posttest vocal performance assessments. Gould (1968) reports that using the same song in both pretests and posttests may result in a "carry-over" effect, regardless of treatment. Similar, but not identical songs, should be used, one for pretests and the other for posttests.

A fifth and final weakness of the study was its limited duration; 5 weeks of vocal instruction may be insufficient to produce significant vocal results among untrained singers.

Purpose of the Study

The present study was designed to overcome some of the weaknesses of the Barnes study and to assess the effects of training in breath control. It was believed that breath control training would be particularly effective in improving vocal performance (see Phillips, 1983, for a development of this argument). Specifically, we wanted to determine whether the vocal knowledge, attitudes, and vocal performance of elementary education majors would improve as a result of extended vocal instruction (ten weeks) using more sophisticated instrumentation for breathing measurement, more reliable vocal knowledge and attitudinal measures, and more rigorous data analyses.

Subjects

The subjects were 43 elementary education majors (6 male and 37 female) enrolled in a one semester undergraduate methods and materials course for the classroom teacher at The University of Iowa. These students elected to take this course to fulfill part of their certification program, but were not required to do so.

Three intact classes were involved in the study. Treatment conditions were randomly assigned as follows: Vocal Instruction with Breath Emphasis (VWB, N=18), Vocal Instruction without Breath Emphasis (VWOB, N=18), and a Control Group (CG, N=8). Each of the three groups met twice weekly, for 50 minute periods, over 10 weeks. Vocal instruction was given to the two treatment groups during the first 10 minutes of class by one of the present investigators. Normal classroom activities were conducted by the regular course instructor for the remaining 40 minutes in the two treatment groups and for the entire 50 minutes in the control group. One university instructor taught both the VWB and VWOB classes, and another taught the CG class. Both instructors were aware of the nature of the study, and did not add any additional instruction to the prescribed course syllabus that would have interfered with the treatment conditions.

Procedure and Measures

Prior to the treatment, subjects completed a self-report inventory assessing knowledge of singing skills and vocal physiology (20 items), self-perception of singing abilities (13 items), and attitude toward singing instruction (17 items). The "Vocal Knowledge" measure (see Appendix A) was constructed by the present investigators to assess important "knowledge" and "comprehension" level objectives (Bloom, 1956) for the vocal instruction classes. Approximately 40 initial items were screened for relevance to the objectives of the study and for potential flaws by the present investigators

and two measurement professionals. The final 20 items included in the measure were judged to be of the highest technical quality, and best suited to the objectives of the study. Measures of "Self-Perception of Singing Ability" (see Appendix B) and "Attitude Toward Singing Instruction" (see Appendix C) were adapted from Barnes (1987). Barnes' items were rephrased, deleted or expanded to better reflect the goals of the present study.

Upon completion of the self-report inventory, the subjects were scheduled for separate fifteen minute "singing assessment" appointments, in which one of the present investigators and a research assistant collected data on the following measures: 1) highest and lowest pitches sung (expressed as whole numbers), 2) vocal range (in number of half-steps), 3) vocal duration (in number of seconds), 4) vocal performance (taped singing of "America" for the pretest, and "O Music" by L. Mason for the posttest), 5) thoracic breathing (as reflected in mm. of torso displacement), and 6) abdominal breathing (as reflected in mm. of torso displacement). The vocal range measure reflected the mean of three assessments of highest and lowest pitches sung on ascending and descending arpeggios. Vocal duration was measured in relation to a mid-range pitch being sung as long as possible at 80 decibels (using a prescribed marking on a decibel meter) for the mean of three trials. Vocal performance was evaluated by summing the responses of two qualified music specialists, who used separate 5-point rating scales to assess the subjects' pitch accuracy and vocal quality. The pitch accuracy scale reflected the subjects' ability to accurately sing both phrase direction and individual pitches, and the measure of vocal quality required the judges to rate the extent to which a given subject's voice reflected an acceptable vocal model for elementary children's vocal instruction. Both rating scales are given in Appendix D.

Breathing was measured using a Respitrace™ Calibrator System linked to a Linear™ chart pen writer. Two Respibands (thin, gauze-like bands with internal wire sensors) were placed around the torso of the subject, one at the upper chest level and the other at the abdominal level below the lowest rib, and were held in place by Velcro tabs. Each Respiband was connected via a transducer to a separate channel of the pen writer, thus permitting simultaneous but separate and independent measures of thoracic (chest) and diaphragmatic (abdominal) breathing.

All of the singing and breathing measures were described and demonstrated to the subjects in class prior to the separate appointments. Practice before each vocal measure ensured that subjects understood the objective of the task and what they were to do. The piano and a vocal model were used to establish key/tonality for each vocal performance measure. A female research assistant served as the vocal model for the female subjects, and one of the present male investigators served as the vocal model for the male subjects. A Sony two-channel reel-to-reel tape recorder (TC-252) and a stereo microphone (audio-technica AT9400z) were used to record each subject's performance. All dependent measures were administered under identical conditions for all subjects.

The two weeks of pretest data collection were followed by a treatment period of 10 weeks. The first session in the treatment period was a 50-minute lecture demonstration in recognizing the appropriate vocal quality and range for children's singing. Following this initial instruction, the investigator in charge of administering vocal instruction met with the two treatment groups at the beginning of class, twice weekly for 10-minute "voice lesson" sessions. A bell timer was used to ensure that treatment time in both groups was held to ten minutes. Thus, a total of 4 hours in voice instruction was received by each of the treatment groups over the ten week period.

The instruction in singing for both treatment groups included exercises and vocalises involving the techniques of respiration (posture and breathing), phonation (the speaking voice), resonant tone production, diction, and expression. These techniques were drawn from a methodology written by Phillips (1989) for use in beginning vocal instruction. Several children's songs were included in the treatment time to facilitate transfer of vocal techniques to actual song literature.

Both treatment groups used the same exercises, vocalises and songs, and received the same instruction except for the amount of emphasis placed on posture and breathing. Instruction for the VWB group began each time with respiration exercises. Proper breathing techniques were demonstrated to and practiced with the VWOB group in the initial phase of the treatment period, but were not practiced thereafter; infrequent reminders to "breathe deeply" were the only instruction given to this group. The control group met with their regular course instructor, not one of the investigators, and followed the normal course syllabus. They received no instruction on singing but instead practiced singing songs as prescribed by the course syllabus.

Following the 10 weeks of treatment, the three groups were posttested in class with the same measures assessing vocal knowledge, self-perception of singing ability, and attitude towards vocal instruction that were used as pretests. In addition, a parallel form of the vocal knowledge test was administered to rule out any contamination of results due to memory effects. This parallel form (See Appendix A) was constructed using the same procedures as the original form. Individual "singing assessment" appointments again were scheduled for posttest measures of vocal performance and breathing. These measures were identical to the pretest measures except that "O Music" rather than "America" was used for assessing vocal performance.

Results

The reliabilities for the measures employed in the study are given in Table 1. Internal consistency estimates (coefficient alphas) are based on "items" for the vocal knowledge and attitudinal measures, "judges" for the pitch accuracy and vocal quality measures, and "trials" for the other "vocal performance measures." As is evident from Table 1, internal consistencies are quite high (above .95) in most cases. The low internal consistency (.32) for pretest scores on the vocal knowledge test (Form A) was anticipated because students were not expected to know much about singing prior to the treatment. As a result, the range of pretest scores was narrow and the reliability coefficient was attenuated. However, the internal consistency of Form A as a posttest increased to .80, reflecting the broader range of achievement after instruction An equivalent-forms reliability coefficient of .81, based upon posttest administrations of forms A and B, provided additional evidence of the reliability of the vocal knowledge tests.

Insert Table 1 about here

It also should be noted that the test-retest reliability estimates are lower in comparison to the internal consistency estimates. These anticipated results indicate that scores change to a certain extent over time. The instability of scores is greatest for attitudinal, vocal knowledge and breathing measures, areas in which the treatment was expected to have its strongest impact.

The data were analyzed using both MANCOVA and ANCOVA with the SPSSX mainframe computer package. Alphas of .10 and .05 were set for multivariate and univariate tests respectively. To control the probability of Type I Error, measures were analyzed within content-related subsets. That is, the

vocal knowledge tests, self-perception of singing ability items, performance measures for song (judged pitch quality, accuracy, and breathing measures), and performance measures for vocal parameters (high and low pitch, range, duration, and breathing measures) each initially were analyzed within a MANCOVA design with pretest measures as covariates and corresponding posttest measures as dependent variables. Three out of four designs revealed a statistically significant treatment effect at the .05 level: vocal knowledge test (Wilks Lambda (4,84)=.718), $p < .007$), self-perception of singing ability items (Wilks Lambda (26,34)=.161, $p < .034$), and performance measures for vocal parameters (Wilks Lambda (10,62)=.517, $p < .017$). The remaining design, performance measures for song, was significant beyond the .10 level (Wilks Lambda (8,66)=.665, $p < .081$). These multivariate tests were followed by a series of univariate ANCOVAS to determine the specific dependent measures most responsible for treatment effects. An ANCOVA also was used to analyze total scores on the "attitude towards singing instruction" measure with pretest attitude total scores as a covariate and posttest total scores as the dependent variable.

ANCOVA results and treatment means adjusted for corresponding pretest scores are presented in Table 2. As can be seen from the table, significant treatment effects favoring both vocal instruction groups over the control group appear for both forms of the vocal knowledge test, the self-perception item "I know how to breathe properly when singing," and the vocal performance measure "high pitch." Significant differences favoring the VWOB group over the control group appear for the self-perception items "I like the sound of my singing voice" and "I feel comfortable singing a solo in front of others." A significant difference favoring the VWOB group over both the VWB and control groups appears on the "attitude towards singing instruction" measure. Finally, a significant difference favoring the VWB group over the VWOB group

appears for the vocal performance measure "judged vocal quality." It also should be noted that on nearly all measures, even if not statistically significant, both vocal instruction groups have higher adjusted means than the control group. In addition, the VWB group has higher adjusted means than the VWOB group on several vocal performance measures, namely, high pitch, range, abdominal breathing for duration, abdominal breathing for singing, judged vocal quality, and judged pitch accuracy.

Insert Table 2 about here

Discussion

This study sought to determine the effects of vocal instruction with and without breath emphasis on the vocal knowledge, attitudes, and vocal performance of university elementary education majors. Multivariate statistical tests revealed significant differences among treatment groups within each of these three areas. Subsequent univariate tests and post hoc comparisons indicated that most of the important differences were between the control group and one or both of the vocal instruction groups.

Results of the analysis of vocal knowledge tests indicated that both of the vocal instruction groups scored significantly higher than the control group. The conclusion that vocal instruction enhances vocal knowledge seems reasonable since vocal instruction groups outperformed the control on two independent measures of vocal knowledge (test forms A and B). These findings support those reported by Barnes (1987). While these results are not surprising, they suggest that the traditional course content for elementary education majors (as prescribed in the present course syllabus) is lacking in vocal knowledge content. Therefore, it may prove beneficial for methods

teachers to consider the inclusion of vocal knowledge (vocal physiology, vocal technique, and characteristics of good singing) into the course outline.

Subjects' attitude toward singing instruction, although positive for all groups (adjusted means ranged from 3.70 to 4.17 on a 5-point Likert scale), were more favorable in the vocal instruction groups. The VWOB group, with less emphasis on breathing, scored significantly higher in attitude than the VWB group and the control group. However, it would be unreasonable to conclude that these differences between the VWOB and VWB groups resulted from a lack of emphasis on breathing, since the control group had no breathing instruction.

One explanation may be the nature of the VWOB group. It was observed by the present investigator, who taught both vocal instruction groups, and the regular classroom instructor that the VWOB group demonstrated a better attitude toward all music instruction throughout the duration of the study. This was confirmed by higher pretest mean scores on attitudinal measures for the VWOB group when compared to the other groups. Although covariance analyses were designed to compensate for pretest differences, they provide less effective experimental controls than random assignment of subjects to treatment conditions.

Another explanation for the significant difference between the VWOB and VWB groups may that the emphasis on breathing preoccupied VWB subjects, making the experience of singing somewhat less enjoyable for them. Recall that in the Barnes (1987) study, only the vocal pedagogy/art song condition demonstrated more positive attitude than the control group. Thus, vocal instruction, alone, may not improve attitude towards singing instruction among elementary education majors as effectively as vocal instruction coupled with some other activities. Further research should seek to determine more

specific procedures methods teachers can use to encourage a positive attitude towards teaching music.

As was the case for measures of vocal knowledge and attitude toward singing instruction, vocal instruction group mean scores were higher than control group mean scores on most self-perception of singing ability items. However, among these thirteen items, only three revealed significant differences between the control group and one or both of the vocal instruction groups. The item "I can breathe properly for singing," was significant for both vocal instruction groups when compared to the control group. Evidently, the breathing instruction had a positive effect on the subjects' perceptions of their breathing for singing. However, the additional emphasis in breathing received by the VWB group did not produce significant results between it and the VWOB group. Recall that the initial sessions for the VWOB group did include some instruction in breathing techniques. Perhaps these limited but informative sessions were just as effective as the sessions for the VWB group, which continually emphasized breathing. Although the optimal amount of time that should be devoted to breathing techniques has not been determined, methods teachers should note that at least some amount of breathing instruction may increase students' self-perception of proper breathing mode.

It is interesting to note that the adjusted means for all treatment groups on the item "I feel comfortable singing a solo in front of others" were far lower than the adjusted means on any of the other self-perception items. Confirming the results of Evans (1958) cited earlier, this indicates that elementary education majors feel particularly insecure in singing for others. While the means on this item were low for all groups, only the VWOB group had significantly higher scores than the control group. The VWOB group also had a significantly higher adjusted mean score than the control group on the item "I like the sound of my singing voice." Further examination of the adjusted

means in Table 2 reveals a pattern in which the VWOB group had higher scores than both the VWB group and the CG on almost all attitudinal measures. Thus, concurrent with their more positive attitudes towards teaching singing, the VWOB group tended to feel more positive about their singing abilities.

The superiority of the VWOB group on attitudinal measures, however, did not generalize to measures of vocal performance. In fact, the VWB group had significantly higher scores on judged vocal quality, and higher means than the other groups on other vocal performance measures, i.e., judged pitch accuracy and abdominal displacement scores. This suggests that the effects of additional emphasis in breathing are manifested most in the actual performance of songs. Although improvements in vocal performance cannot be attributed with certainty to increased breathing emphasis in the vocal instruction, this conclusion is plausible because the VWB group had a far greater adjusted mean than the other groups on the abdominal displacement measure for singing a song, and this difference approached statistical significance ($p < .093$). The difference between the vocal instruction and control groups on judged breathing mode also approached significance in the study by Barnes (1987). Evidently, the duration of both the Barnes study (5 weeks, two 40-minute sessions per week), and the present study (10 weeks, one 50-minute orientation session followed by two ten-minute sessions per week) were not sufficient to produce statistically significant results for breathing measures. If breathing instruction does make a difference, future research should seek to determine the length of time needed to change breathing patterns.

One final point should be made concerning the results of the vocal performance measures. In this study, both vocal instruction groups showed significantly higher mean scores than the control group on hign pitch, and approached significance in range. This suggests that vocal instruction for

the elementary classroom teacher (even without breathing emphasis) may effectively extend vocal range, particularly in the upper register.

Within the limitations of this study, the results suggest that vocal instruction for elementary classroom teachers is beneficial for improving vocal knowledge and some elements of attitude and vocal performance. Emphasis on breath instruction improved vocal quality. However, the effects of breath instruction on changes in breathing mode, while increasing depth of breathing with greater abdominal-diaphragmatic displacement, may take longer than anticipated in producing significant results, especially among untrained singers.

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Table 1

Reliability Estimates for All Measures

Measure	Type of Reliability Estimate: Internal Consistency, Pretest	Internal Consistency, Posttest	Test-Retest
Vocal Knowledge Measures			
Form A	.32	.80	.41
Form B	--	.74	--
Attitudinal Measures			
Singing Instruction	.89	.86	.47
Self-Perception of Singing Abilities	.95	.94	.76
Vocal Performance Measures			
High Pitch	.99	.99	.94
Low Pitch	.99	.99	.90
Range	.98	.97	.77
Duration	.96	.97	.80
Judged Pitch Accuracy	.93	.96	.73
Judged Vocal Quality	.86	.83	.64
Thoracic Displacement[a]	.95	.94	.78
Abdominal Displacement[a]	.97	.95	.43
Thoracic Displacement[b]	--	--	.51
Abdominal Displacement[b]	--	--	.30

[a] Thoracic and abdominal measures were taken simultaneously with duration measures.

[b] Thoracic and abdominal measures were taken simultaneously with singing of song. Since these measures involved only one trial, internal consistency estimates could not be computed.

Table 2

ANCOVA Results and Adjusted Treatment Means for All Dependent Measures

Dependent Measure	ANCOVA Results	Adjusted Means		
		VWB	VWOB	CG
Vocal Knowledge Tests				
Form A	$F(2,43)=7.87, p=.001$*[a]	12.2	13.1	7.6
Form B	$F(2,43)=6.85, p=.003$*[a]	12.0	13.0	7.9
Attitudinal Measures				
Singing Instruction	$F(2,40)=7.47, p=.002$*[b]	65.5	70.9	62.9
Self-Perception of Singing Ability Items				
Stand & Sit Properly	$F(2,41)=2.12, p=.134$	4.2	4.5	4.1
Sing In-tune	$F(2,41)=2.12, p=.133$	3.7	4.0	2.8
Breathe Properly	$F(2,41)=6.60, p=.003$*[a]	4.2	4.3	3.0
Correct Vocal Model	$F(2,41)=1.73, p=.191$	3.7	4.2	3.7
Like Sound of Voice	$F(2,41)=3.99, p=.026$*[c]	3.6	3.8	3.0
Vary Voice Volume	$F(2,41)=0.69, p=.507$	4.8	4.7	4.4
Hear Out-of-Tune Notes	$F(2,41)=1.54, p=.228$	4.3	4.8	4.5
Project Voice	$F(2,41)=1.04, p=.363$	3.6	4.0	3.5
Sing Wide Range	$F(2,41)=0.11, p=.900$	3.6	3.5	3.4
Don't Run Out of Air	$F(2,41)=2.81, p=.072$	4.2	4.0	3.4
Pronounce Words Properly	$F(2,41)=0.06, p=.940$	4.1	4.1	4.2
Comfortable Singing Solo	$F(2,41)=3.82, p=.030$*[c]	2.4	2.8	2.0
Comfortable Singing in Group	$F(2,41)=1.47, p=.242$	4.6	4.7	4.1

Table 2 Continued

ANCOVA Results and Adjusted Treatment Means for All Dependent Measures

Dependent Measure	ANCOVA Results	Adjusted Means		
		VWB	VWOB	CG
Singing Performance Measures				
Duration	F(2,39)=2.47,p=.097	11.8	13.4	10.9
High Pitch	F(2,39)=6.76,p=.003*[a]	42.7	42.1	40.3
Low Pitch	F(2,39)=0.03,p=.970	16.0	16.0	15.9
Range	F(2,39)=2.17,p=.128	27.6	27.0	25.6
Judged Vocal Quality	F(2,39)=3.60,p=.037*[d]	3.0	2.5	2.6
Judged Pitch Accuracy	F(2,39)=0.85,p=.437	3.7	3.4	3.4
Thoracic Displacement[e]	F(2,39)=1.25,p=.297	12.0	13.5	11.7
Abdominal Displacement[e]	F(2,39)=1.27,p=.292	7.8	6.1	4.2
Thoracic Displacement[f]	F(2,39)=1.62,p=.211	10.6	13.3	10.2
Abdominal Displacement[f]	F(2,39)=2.53,p=.093	10.0	5.9	5.3

* Significant difference among adjusted means at the .05 level.

a Based on Bonferroni post hoc comparison tests, both VWB and VWOB adjusted means were significantly higher than the CG adjusted mean ($p<.05$).

b Based on Bonferroni post hoc comparison tests, the VWOB adjuste' mean was significantly higher than both VWB and CG adjusted means ($p<.05$).

c Based on Bonferroni post hoc comparison tests, the VWOB adjusted mean was significantly higher than the CG adjusted mean ($p<.05$).

d Based on Bonferroni post hoc comparison tests, the VWB adjusted mean was significantly higher than the VWOB adjusted mean ($p<.05$).

e Thoracic and abdominal measures taken simultaneously with duration measures.

f Thoracic and abdominal measures taken simultaneously with singing of song.

Appendix A

Tests of Vocal Knowledge

[Please note that Form A is items 1-20 and Form B is items 21-40.]

Questions 1-40 are about vocal techniques. Please CIRCLE one answer for each question. If you do not know an answer, circle your best guess. Be sure to answer all the questions.

1. "Resonance" refers to what vocal characteristic?

   A. Pitch
   B. Quality
   C. Intonation
   D. Loudness

2. The slight even wavering of pitch in the voice is called a

   A. tremolo.
   B. wobble.
   C. vibrato.
   D. shimmer.

3. What type of breathing is best for singing?

   A. Diaphragmatic
   B. Lower Abdominal
   C. Rib
   D. Upper Chest

4. Which of the following vocal techniques should be taught first?

   A. Tone Production
   B. Diction
   C. Breathing
   D. Posture

5. The power or "support" for singing comes from the

   A. diaphragm.
   B. internal intercostals.
   C. external intercostals.
   D. abdominal muscles.

6. What laryngeal position do most "pop" singers use?

   A. High
   B. At rest
   C. Up and down with the pitch
   D. Depressed

7. How should the abdominal area function for proper "inhalation" for singing?

   A. Move up and inward
   B. Expand outward
   C. Push downward
   D. Remain stable

8. What area of the vocal folds vibrates for the low or "speaking" voice?

   A. The inner edges only
   B. The front part only
   C. The back part only
   D. The full length and width

9. Which of the following serve as the primary basis for vocal tone?

   A. Vowels
   B. Consonants
   C. Diphthongs
   D. Pitches

10. It is best to begin vocal training in

    A. grade 1.
    B. grade 3.
    C. grade 5.
    D. grade 7.

11. What type of breathing is typically used in running?

    A. Diaphragmatic
    B. Lower Abdomen
    C. Upper Chest
    D. Rib

12. What laryngeal position does the trained singer use?

    A. Up and down with the pitch
    B. High
    C. Depressed
    D. At rest

13. It is best to begin vocal exercises for children with the vowel sound

    A. "ah".
    B. "ay".
    C. "oh".
    D. "oo".

14. The major source of "control" for singing comes from the

A. external intercostals.
B. internal intercostals.
C. diaphragm.
D. abdominal muscles.

15. Another name for a "callous" on the vocal folds is a

A. polyp.
B. node.
C. glottal fry.
D. vocal blister.

16. Which of the following is NOT a characteristic of good singing posture?

A. Spine stretched.
B. Hips rolled under.
C. Weight balanced on the heels of the feet.
D. Knees relaxed.

17. How should the abdominal area function for proper "exhalation" for singing?

A. Remain stable.
B. Move up and inward.
C. Push downward.
D. Expand outward.

18. What is another name for the "voice box"?

A. Larynx
B. Pharynx
C. Vocal Cords
D. Adam's Apple

19. During breathing for singing, how should the sternum/chest function?

A. Remain high and tensed.
B. Remain down and relaxed.
C. Remain high and relaxed.
D. More up and down with the breath.

20. What area of the vocal folds vibrates for the high or "upper" voice?

A. The full length and width
B. The back part only
C. The front part only
D. The inner edges only

21. "Dynamics" refers to what musical characteristic?

A. Pitch
B. Quality
C. Intonation
D. Loudness

22. The large muscle that separates the thoracic cavity from the abdominal cavity is the
    A. diaphragm.
    B. rectus abdominus.
    C. intercostal.
    D. internal oblique.

23. All of the following types of breathing should be used for singing EXCEPT

    A. diaphragmatic.
    B. abdominal.
    C. rib.
    D. upper chest.

24. Which of the following terms refers to the way in which a word is spoken?

    A. Diction
    B. Pronunciation
    C. Articulation
    D. Enunciation

25. What part of the breathing cycle comes between inhalation and exhalation?

    A. Diaphragm Contraction
    B. Abdominal Lift
    C. Suspension
    D. Intercostal Contraction

26. "Accelerando" means to gradually grow

    A. louder.
    B. softer.
    C. faster.
    D. slower.

27. What technique is recommended to encourage a long, deep breath?

    A. Catch Breath
    B. Staggered Breath
    C. Abdominal Breath
    D. Slow Sip Breath

28. How many vocal registers can children sing in when taught properly?

    A. One
    B. Two
    C. Three
    D. Four

29. "Articulation" refers to the production of

    A. vowels.
    B. consonants.
    C. diphthongs.
    D. pitches.

30. A ruptured blood vessel of the vocal folds is a

A. polyp.
B. node.
C. glottal fry.
D. vocal blister.

31. What type of breathing is worst for singing?

A. Diaphragmatic
B. Lower Abdomen
C. Upper Chest
D. Rib

32. What mouth position is best for singing vowels?

A. Horizontal
B. Vertical
C. A combination of horizontal and vertical
D. Open as much as possible

33. Which of the following has been found to be the most vital "link" to improving the singing voice?

A. Listening to good recordings of children's voices
B. Varying the pitch of the speaking voice
C. Standing while singing
D. Singing in a group

34. Sixth graders who have received vocal training may be expected to have a vocal range as wide as

A. one octave.
B. one and a half octaves.
C. two octaves.
D. two and a half octaves.

35. The "chest register" in singing is the same as

A. the speaking voice.
B. the falsetto.
C. the upper voice.
D. the mixed voice.

36. How should the shoulders be held for good singing posture?

A. Back and Down
B. Back and Up
C. Forward and Down
D. Forward and Up

37. Children who have not received vocal training most naturally sing in what vocal register?

A. Falsetto
B. Upper
C. Mixed
D. Chest

38. Another name for the vocal resonator or "throat" is the

A. larynx.
B. pharynx.
C. vocal tract.
D. Adam's apple.

39. During singing, how should the ribs function?

A. Pull in quickly to support the tone
B. Hold out at the beginning of the tone
C. Move in and out with the breath or tone
D. Not move at all for breathing or tone

40. Children should <u>not</u> sing in the pure "chest" register above what pitch?

A. Middle C
B. G above Middle C
C. A above Middle C
D. C above Middle C

Appendix B

Self-Perception of Singing Abilities Measure

Items 1 to 13 are statements about your abilities and attitudes related to singing. CIRCLE the response that best reflects the extent to which you agree or disagree with each statement.

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1. I stand and sit properly for singing.	1	2	3	4	5	6
2. I can sing in tune (without going flat or sharp) throughout a song.	1	2	3	4	5	6
3. I breathe properly when singing.	1	2	3	4	5	6
4. I can provide a correct vocal model for children.	1	2	3	4	5	6
5. I like the sound of my singing voice.	1	2	3	4	5	6
6. I can vary the volume (loudness and softness) of my voice when singing.	1	2	3	4	5	6
7. I can hear when something is out of tune (flat or sharp).	1	2	3	4	5	6
8. I can project my voice effectively when singing.	1	2	3	4	5	6
9. I can sing a wide range of notes (from low to high).	1	2	3	4	5	6
10. I can sing most phrases without running out of air.	1	2	3	4	5	6
11. I pronounce words properly when singing.	1	2	3	4	5	6
12. I feel comfortable singing a solo in front of others.	1	2	3	4	5	6
13. I feel comfortable singing within a group of people.	1	2	3	4	5	6

Appendix C

Attitude Towards Singing Instruction Measure

Items 1 to 17 are statements about the role of the classroom teacher in engaging elementary school children in singing and other musical activities. Please CIRCLE the response that best reflects the extent to which you agree or disagree with each statement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Classroom teachers need to know how to use their singing voices effectively to lead children in singing activities.	1	2	3	4	5
2.	Classroom teachers should know how to teach children to sing.	1	2	3	4	5
3.	Classroom teachers should be able to provide an effective model for musical performance without the aid of a recording.	1	2	3	4	5
4.	Training in singing is more important than training in piano for teaching children music.	1	2	3	4	5
5.	In a teacher certification program, voice class should be a required course for elementary education majors.	1	2	3	4	5
6.	Specific vocal training should be part of this music skills and fundamentals class (i.e., course 7E:120).	1	2	3	4	5
7.	Even when there is a music specialist, the classroom teacher should take an active role in teaching songs.	1	2	3	4	5
8.	Children should sing in the elementary class in some form (music lesson or one song) every day.	1	2	3	4	5
9.	Classroom teachers who are able to sing are more likely to engage children in general music activities.	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.	The use of recordings is <u>not</u> as effective in teaching singing as the teacher.	1	2	3	4	5
11.	Classroom teachers who are able to sing are more likely to engage children in singing activities.	1	2	3	4	5
12.	Training in singing is more important than training in recorder for teaching children music.	1	2	3	4	5
13.	Most of the skills for teaching singing can be learned by the prospective teacher.	1	2	3	4	5
14.	Children's attitudes toward singing are likely to be positive if classroom teachers engage them in singing activities.	1	2	3	4	5
15.	Knowledge of one's own singing voice would likely improve one's ability to lead children in singing activities.	1	2	3	4	5
16.	More singing experiences during preservice training would be beneficial in preparing prospective classroom teachers to engage children in singing activities.	1	2	3	4	5
17.	Classroom teachers would engage children in more singing activities if they felt confident in their singing abilities.	1	2	3	4	5

Appendix D

Vocal Performance Rating Scales

VOCAL TEST MEASURE

Subject_____ Section #_____

Date of Testing_____ Rater #_____ ID #_____

1. Pitch Accuracy Measure

Please circle the number that most represents an accurate description of the subject's pitch accuracy in song.

RATING SCALE

5 - SUPERIOR ACCURACY: Subject can sing the song correctly with direction and accurate matching of pitch (98%).

4 - HIGH ACCURACY: Subject can sing the song correctly with direction and accurate matching of most pitches (90%).

3 - MEDIUM ACCURACY: Subject can sing the song correctly with direction and accurate matching of at least half the pitches (50%)

2 - LOW ACCURACY: Subject can sing the song with general direction and accurate matching of less than half the pitches.

1 - NO ACCURACY: Subject cannot sing the song with direction or accurate pitch, or - no response.

2. Vocal Quality Measure

Please circle the number that most represents an accurate description of the subject's vocal quality as it reflects an acceptable vocal model for teaching elementary students to sing.

RATING SCALE

5 - EXCELLENT: Subject's vocal quality represents the most ideal model for children's singing.

4 - GOOD: Subject's vocal quality represents an above average model for children's singing.

3 - ADEQUATE: Subject's vocal quality represents a fair model for children's singing.

2 - BELOW AVERAGE: Subject's vocal quality represents an inferior model for children's singing.

1 - POOR: Subject's vocal model represents a poor model for children's singing.